

The Cary Arboretum



of The New York Botanical Garden

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Arboretum Offers Horsepowered Tours

Horsepower and sunpower are co-starred in a new program of public tours at the Arboretum, starting Mother's Day, May 9th.

Visitors will be shown the 2,000 acre grounds in a specially-designed horse-drawn sightseeing wagon. Friends of the Arboretum whose membership is current are entitled to a 20 percent discount. Guests of Friends and the public are welcome. There is a charge of \$3.50 per person for the tour. Reservations are necessary and can be made by calling 914-677-5071 weekdays.

The tours start at the construction site of the Arboretum's new solar-heated Research and Administration Building, one-fourth mile in from Route 44 on the Sharon Turnpike.

The horse and ten-passenger wagon, provided by the Victor Shone stable, also of Millbrook, will transport visitors on a scenic trip through the Arboretum. Shone, who specializes in horse-drawn vehicles, recently provided some of his animals and

equipment for scenes in the TV series "The Adams Chronicles."

Why the horse and wagon? The Arboretum believes this mode of transport is best suited to its philosophy of saving energy and protecting the environment. The same point of view inspired the Arboretum to plan a headquarters building heated mainly by the rays of the sun and incorporating systems to recycle air, water, and waste materials. Construction of the \$3,000,000 building is now underway.

The horse and wagon will meander through sections of the Arboretum's five-mile internal road system, stopping at several points of interest on the former estate of the late Mr. and Mrs. Melbert B. Cary. Scenic highlights include crossing a quaint stone bridge spanning the east branch of the Wappingers Creek, as it winds through a ravine wooded with virgin hemlock. Up the road, at a steep overlook, one can see a spectacular view of the Hudson Valley and the Catskill Mountains in the distance.

The tour includes the Arboretum's Greenhouse and Tree Nursery Center on Route 82, where horticulturists are growing an extensive collection of woody plants from seeds and cuttings obtained from all over the world. Highlights of the collection, which visitors will see, are young plants grown from seed presented to the Arboretum by botanical gardens in Mainland China.

Horsepower at the Cary Arboretum: On Mother's Day, May 9, the Cary Arboretum in Millbrook, New York, will start horse-drawn tours for the general public. In this picture, stable owner Victor Shone, driving a surrey, demonstrates the route to (left to right) Janice Clairborne, James Scott, and Carol Coutant of the Arboretum staff. Reservations for the tours can be made by telephoning 914-677-5071.



The Good Seed

All through the year most of the world's botanical gardens and arboreta gather seeds from their collection of plants, or from plants growing native or wild in their geographical area. Each year a list is published of these collected seeds, which is then sent to other botanical gardens and arboreta in a free, scientific exchange program.

The Cary Arboretum shortly will be publishing its latest annual list, called (in Latin) *Index Seminum*, listing all the seeds available to other institutions which were collected in Dutchess County during 1975. The publication of an *Index Seminum* was one of the first projects undertaken when the Arboretum was in its infancy in 1972. The program is directed by Horticulturist Robert Hebb.

The Cary Arboretum seed list consists almost entirely of seeds collected locally in the Hudson Valley, and comprises woody plants (trees and shrubs) and wildflowers. This year the *Index Seminum* will offer 130 different species.

Robert Hebb, horticulturist of the Cary Arboretum in Millbrook, New York, checks on seedlings being grown from seeds received from China. The Arboretum, a branch of the New York Botanical Garden, was the first American scientific institution to obtain a shipment of seeds from China after re-establishment of relations between the two countries. The Chinese plants are being cultivated for eventual planting on the 2,000-acre grounds of the Arboretum, as part of its scientific plant collection.

Paul Mihan, Greenhouse Propagator, and his staff start this program in the spring of each year by searching the area for plants and fruit in seed. Timing, of course, is most important, since the seed must be obtained before the plant disperses it and before birds or squirrels eat it. Seed collection continues throughout the growing season until late autumn.

When the seeds are collected, a voucher specimen is prepared. This involves drying and pressing the leaves, stem, flowers and fruit of the plant into a herbarium specimen, which then is labeled and is the official reference for future identification of the particular seed.

The collected seeds are laid on trays and dried in the greenhouse. Seeds in pulp casing are put through a blender in order to remove the pulp. Seeds bearing chaff are both hand-cleaned and sifted so that the chaff is removed. After cleaning, the seeds are stored in glass bottles and refrigerated, in order to maintain their quality.

All seeds sent out by the Arboretum are checked for cleanliness and ability to germinate. They also must be certified to be free of disease by the U. S. Department of Agriculture, which has a station in Hoboken, New Jersey, and a sanitary certificate must be issued.

The Arboretum *Index Seminum* is quite unique in the authenticity of material it offers, because the collection point of each variety is known and its derivation is published in the list. This is backed up by the voucher specimen, should questions

concerning identity arise at some future time.

About 200 lists from other botanical gardens and arboreta are received each year. Approximately 2,000 lots of seed from throughout the world arrived in Millbrook last year, and all of them have now been sown in the greenhouse. For example, about 80 lots of maple, representing 45 species, were sown last year alone. Of these 45 species, possibly 35 never have been grown in the Hudson Valley. Experimenting with these new species is part of the Arboretum's program to introduce new types of trees for use in our climate.

Seeds from scientific institutions do not arrive in colorful packets, complete with growing instructions, and unlike vegetables or annuals which germinate soon after sowing, trees and shrubs may contain dormant embryos, chemicals which inhibit growth, or hard seed coats which may delay germination. Some seeds may even possess a combination of such features. In nature, such seeds do not germinate for one or two years from the time they fall to the ground. Some seeds with particularly hard seed coats may lay in the ground for ten to twenty years and more, before the seed coat has broken down sufficiently to allow germination to occur.

Many techniques are employed on an experimental basis at the greenhouse to overcome these dormancy or inhibitory factors in the shortest amount of time possible. One method is to place the seed in a mixture of moist sand and peat moss and to keep it in the refrigerator for two



Dr. Karnosky Receives Forestry Grant

to three months. This is a process known as cold stratification, and it stimulates the winter conditions during which the embryos of many seeds mature in nature. Other seeds require a warm stratification period, which is accomplished by leaving them on a bench in a heated greenhouse. Some need cold temperatures followed by warm, while others require the reverse. Very hard seed coats may be broken by nicking with a file or, in the case of very small seeds, immersion in concentrated sulfuric acid for varying periods of time (5-20 minutes) will break the seed coat down sufficiently to allow germination to take place. This treatment may seem a bit severe, but if done properly, the seed is not harmed at all. Seeds containing chemicals which inhibit germination are frequently immersed in running water for various periods of time. This simple process washes the inhibiting chemical away and usually cuts germination time in half.

The problem faced by the horticultural staff at the greenhouse is that, in many instances, the proper treatment to insure rapid germination is unknown. With the many thousands of seeds which are being received, the Arboretum will be able to build an extensive bank of information pertaining to the best methods of germinating woody plant seeds. When this is accomplished, such information will be of great value in the future production of our living plant collections and to other horticulturists, nurserymen, and botanical gardens.

Seed lots received by the Arboretum may vary from a single seed to many hundreds. If enough seeds are received, the group will be separated into lots and exposed to as many as five different kinds of treatments, including leaving some of the seed untreated, as a control group. An extensive card file is being developed, and data are being assembled as to the types of treatment used and germination results obtained from each treatment.

The aim of the greenhouse staff is to determine the best method of germination and then to successfully germinate as many seeds as possible. The dedicated young staff are justifiably proud of their record in sowing all the seeds that have been received so far, and they plan to continue to increase their exacting work as the seed exchange program develops in the years to come.

Free Plant Material

Free surplus plant material will be available to Friends of the Arboretum on May 29th from 9 a.m. to noon at the Cary Arboretum greenhouse on Route 82.

Selections will include small trees, shrubs and perennials from all over the world, including some from our Chinese collection.

Due to limited quantities, only one plant can be given to each member. The Arboretum requests that you bring a suitable plant container or wrapping, as well as your current membership card.

The effects of air pollution on trees in urban environments will be researched by Dr. David Karnosky of the Cary Arboretum through a \$20,000 grant from the U. S. Forest Service.

The forestry grant, awarded to Karnosky in April, was the first given to someone outside the Pinchot Consortium for Environmental Forestry Studies. Twelve major universities in the northeast make up the Consortium, whose research funds are provided by the Forest Service.

Karnosky, who holds a Ph.D. in forest genetics, said the ultimate goal of the study is to develop trees that are more resistant to pollution.

In the first phase of the project, which will begin at the Arboretum, varieties of maples, ash, honeylocusts, and ginkgo will be placed in special air pollution chambers in which they will be subjected to sulfur dioxide and ozone (two components of smog) for three-hour periods. These tree specimens will then be ranked as to their pollution tolerance.

Maples and ginkgos are fairly resistant to pollution, and ash are not, Karnosky said. "However, nurserymen lack information regarding air pollution tolerances of these strains of trees that are being commonly used in urban planting today. Therefore, they cannot make recommendations on what to plant in polluted areas."

The second phase of the study will subject trees to actual urban conditions. In this part of the research, Karnosky plans to plant and observe trees at selected sites in New York City. However, the test trees will not be planted along city streets because of other injurious factors, such as vandalism, dogs, and soil conditions, which would hamper the experiment's validity. Dr. Karnosky is considering locations such as on an island in the East River.

An air pollution chamber that will be used in the research is now under construction in the Arboretum's greenhouse. Tree seedlings have been set out in an irrigated field on the grounds to be grown for use in these tests.

New Arboretum Book on City Trees

Planning, maintaining and planting trees for urban and town use is important if man is to escape the artificial environment he has so unwisely created, according to a new publication edited by Dr. Thomas Elias of the Cary Arboretum.

The booklet, entitled "Trees in the Community", a collection of articles by tree experts, is aimed at helping cities and towns across the northeast bring the forest to the city by planting and maintaining trees. "Perhaps it's time," said Carlton Lees, vice president of the New York Botanical Gardens, in his chapter of the book, "that we begin to measure civilization in terms of not how much concrete we pour, but rather how many trees we plant."

Aside from the esthetically pleasing environment created by tree planting, Dr. Elias' book also discusses the biological importance of trees for man's survival.

According to the Arboretum publication, trees not only provide a diversion from asphalt and steel, but form the base of the life support system by providing oxygen. Each year an acre of trees can produce enough oxygen to keep 18 persons alive.

The booklet not only advocates planting trees, but also tells how to plan, plant and maintain new and existing trees.

Trees must be chosen carefully for urban-street use, said Dr. Elias in the article "Planting the Community", included in the booklet. City streets are hostile environments — salt, dog urine and poor soil will kill new or existing trees, he said.

What should towns and cities plant? There is no ideal street tree, he said.

To avoid having street trees decimated by disease or insects, Dr. Elias advocates using

a greater variety of trees than is now standard practice.

For example, a recent survey in the Village of Millbrook, conducted by the Cary Arboretum, revealed 58% of all street trees there are sugar maple. Village trees thus would be highly vulnerable if a disease similar to Dutch Elm attacked sugar maples.

Another important factor in keeping a community green is maintaining new and existing trees. The key word is commitment, said nursery man C. Powers Taylor in his article "Planting and Townscape", which appears in the booklet.

Mr. Powers also provides down-to-earth information on planting sites, actual planting and useful hints such as digging a square hole for tree roots and wrapping trunks for protection.

"Trees in the Community", containing 36 pages, has been published by the Cary Arboretum. Copies may be ordered at \$4.50 apiece from the Cary Arboretum, Box AB, Millbrook, N. Y. 12545

Trees and the Community

Edited by Thomas N. Elias
The Cary Arboretum of the New York Botanical Garden

Proceedings of a symposium presented at
Manit 1 College, Philadelphia, New York
September 1974
The NY Botanical Garden and The Philadelphia Area and
September 1975

Cary Perspectives

A Bicentennial Look at Science

At this milepost in our nation's history, the familiar mass market of consumerism has come under vigorous attack by social philosophers in many cultures. Yet scarcely any attention has been given the consumerism and faddism rampant in the bureaucratized science-industrial complex. Everyone who "counts" lays claim to a new advance in xerography, electronic calculators, laser generators, atom smashers, scanning electronic microscopes, radio telescopes, etc., etc. Although this hyperthyroid one-upmanship might be dubbed the "tinker-toy" complex in scientific consumerism, we must also remember that without it the model of the double-helix might never have been devised!

Since World War II the former pace of scientific progress has been subjected to the catalyzing application of advanced industrial methods, one result of which has been the emergence of capital-intensive "big science." In one typical "big science" — high-energy physics — it is assumed that as productivity in industry is commensurate with the magnitude of capital investment, the same will be true in the physics lab. But if we examine the results, the reverse has been true. In Newton's day, the primitive telescope was the physicist's principal tool, the brain-driven pencil his recorder. Nature was a vast, unexplored territory and virtually every new discovery was of monumental significance. Since then, each new advance has led to more and more intricate capital equipment; the paper and pencil gave way to the research laboratory, which in turn led to the research institute. Equipment progressed from bell jars and tuning forks to mile-long high-energy accelerators. But as the investment in new equipment rose, the significance of new discoveries declined. Put another way, more and more quantitatively was learned about less and less qualitatively. And now, one of today's leading high-energy physicists claims that current research in

his field has no foreseeable practical application. Others are not so pessimistic, but a conclusion inevitably emerges: spending more to learn less, sooner or later it becomes necessary to evaluate whether the goals of proposed new investments are worth the cost. And this in turn foretells a limit to at least certain kinds of scientific progress and the political regulation of those avenues of research deemed worth the price, with such political control reflective of big science's almost total dependence on public funds and widespread public fear of deleterious social consequences arising from certain kinds of research.

Much related commentary is current in the scientific press these days, some of which portends a transmutation of science, continuing the process by which today's bureaucratized science was derived from the aristocratic dilettantish philosophical science of ancient Greece, the literary science of Mandarin China, and the monastic theological science of the pre-Reformation period. The urgency of this transmutation reflects not only an awareness of the limits of growth in "big science" as we know it, but also the bureaucratic discrimination against youth and genius and the decreasing significance of much apparent innovation, none of which augurs well for the increased knowledge and changed public attitudes necessary for future social accommodation to the politics of the less.

A review of the scientific activities of the Cary Arboretum clearly shows their "little science" affinities with modest capital requirements but with significant real and potential social impact, as in the search for pollution-tolerant trees suitable for urban use, the investigation of the function of nectar-producing bodies occurring on plants away from the flowers, the application of botanical and broader biological and ecological truths to environmental

protection and master planning, and the systematic introduction and testing of trees and shrubs hitherto not measured for their suitability in various man-dominated environments. Against the array of problems before "big science", particularly in research purpose, public policy, and productivity, the importance and promise of these endeavors is high, and their scale appropriate to the resources available to the Arboretum.

Howard S. Irwin
Director



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